

Answers

1. A particle moves along the x axis from x_i to x_f . Of the following values of the initial and final coordinates, which results in the displacement with the largest magnitude?

- A) $x_i = 4\text{m}, x_f = 6\text{m}$
- B) $x_i = -4\text{m}, x_f = -8\text{m}$
- C) $x_i = -4\text{m}, x_f = 2\text{m}$
- D) $x_i = 4\text{m}, x_f = -2\text{m}$
- E) $x_i = -4\text{m}, x_f = 4\text{m}$

2. The position y of a particle moving along the y axis depends on the time t according to the equation

$y = at - bt^2$. The dimensions of the quantities a and b are respectively:

- A) $L^2/T, L^3/T^2$
- B) $L/T^2, L^2/T$
- C) $L/T, L/T^2$
- D) $L^3/T, T^2/L$
- E) none of these

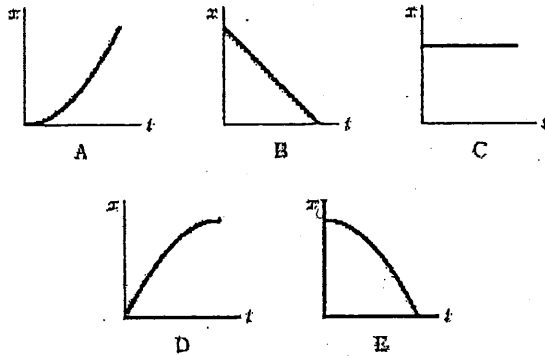
3. A car travels 40 kilometers at an average speed of 80 km/h and then travels 40 kilometers at an average speed of 40 km/h. The average speed of the car for this 80 km trip is:

- A) 40 km/h
- B) 45 km/h
- C) 48 km/h
- D) 53 km/h
- E) 80 km/h

4. The area under a velocity-time graph represents:

- A) acceleration
- B) change in acceleration
- C) speed
- D) change in velocity
- E) displacement

5. Which of the following five coordinate versus time graphs represents the motion of an object moving with a constant speed?



- A) A
- B) B
- C) C
- D) D
- E) E

6. Over a short interval near time $t = 0$ the coordinate of an automobile in meters is given by $x(t) = 27t - 4.0t^3$, where t is in seconds. At the end of 1.0 s the acceleration of the auto is:

- A) 27 m/s^2
- B) 4.0 m/s^2
- C) -4.0 m/s^2
- D) -12 m/s^2
- E) -24 m/s^2

7. The coordinate of an object is given as a function of time by $x = 4t^2 - 3t^3$, where x is in meters and t is in seconds. Its average acceleration over the interval from $t = 0$ to $t = 2$ s is:

- A) -4 m/s^2
- B) 4 m/s^2
- C) -10 m/s^2
- D) 10 m/s^2
- E) -13 m/s^2

8. Each of four particles move along an x axis. Their coordinates (in meters) as functions of time (in seconds) are given by

particle 1: $x(t) = 3.5 - 2.7t^3$

particle 2: $x(t) = 3.5 + 2.7t^3$

particle 3: $x(t) = 3.5 + 2.7t^2$

particle 4: $x(t) = 3.5 - 3.4t - 2.7t^2$

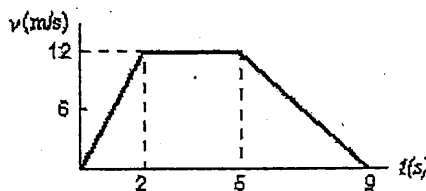
Which of these particles have constant acceleration?

- A) All four
- B) Only 1 and 2
- C) Only 2 and 3
- D) Only 3 and 4
- E) None of them

9. Starting at time $t = 0$, an object moves along a straight line with velocity in m/s given by $v(t) = 98 - 2t^2$, where t is in seconds. When it momentarily stops its acceleration is:

- A) 0
- B) -4.0 m/s^2
- C) -9.8 m/s^2
- D) -28 m/s^2
- E) 49 m/s^2

10. The graph represents the straight line motion of a car. How far does the car travel between $t = 2$ seconds and $t = 5$ seconds?



- A) 4 m
- B) 12 m
- C) 24 m
- D) 36 m
- E) 60 m

11. A stone is thrown vertically upward with an initial speed of 19.5 m/s . It will rise to a maximum height of:

- A) 4.9 m
- B) 9.8 m
- C) 19.4 m
- D) 38.8 m
- E) none of these

12. Let $\vec{V} = 2.00\hat{i} + 6.00\hat{j} - 3.00\hat{k}$. The magnitude of \vec{V} is:

- A) 5.00
- B) 5.57
- C) 7.00
- D) 7.42
- E) 8.54

13. The angle between $\vec{A} = (25 \text{ m})\hat{i} + (45 \text{ m})\hat{j}$ and the positive x axis is:

- A) 29°
- B) 61°
- C) 151°
- D) 209°
- E) 241°

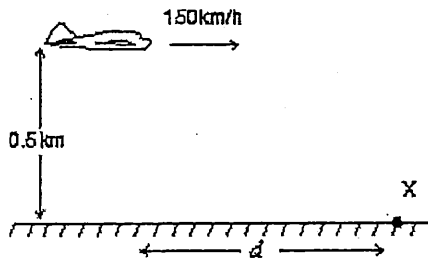
14. Let $\vec{A} = (2 \text{ m})\hat{i} + (6 \text{ m})\hat{j} - (3 \text{ m})\hat{k}$ and $\vec{B} = (4 \text{ m})\hat{i} + (2 \text{ m})\hat{j} + (1 \text{ m})\hat{k}$. The vector sum $\vec{S} = \vec{A} + \vec{B}$ is:

- A) $(6 \text{ m})\hat{i} + (8 \text{ m})\hat{j} - (2 \text{ m})\hat{k}$
- B) $(-2 \text{ m})\hat{i} + (4 \text{ m})\hat{j} - (4 \text{ m})\hat{k}$
- C) $(2 \text{ m})\hat{i} - (4 \text{ m})\hat{j} + (4 \text{ m})\hat{k}$
- D) $(8 \text{ m})\hat{i} + (12 \text{ m})\hat{j} - (3 \text{ m})\hat{k}$
- E) none of these

15. Acceleration is defined as:

- A) rate of change of position with time
- B) speed divided by time
- C) rate of change of velocity with time
- D) a speeding up or slowing down
- E) change of velocity

16. The airplane shown is in level flight at an altitude of 0.50 km and a speed of 150 km/h. At what distance d should it release a heavy bomb to hit the target X? Take $g = 10 \text{ m/s}^2$.

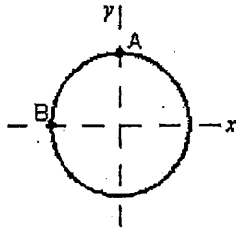


- A) 150 m
- B) 295 m
- C) 417 m
- D) 2550 m
- E) 15,000 m

17. A boy on the edge of a vertical cliff 20 m high throws a stone horizontally outwards with a speed of 20 m/s. It strikes the ground at what horizontal distance from the foot of the cliff? Use $g = 10 \text{ m/s}^2$

- A) 10 m
- B) 40 m
- C) 50 m
- D) $50\sqrt{5}$ m
- E) none of these

18. A toy racing moves with constant speed around the circle shown below. When it is at point A its coordinates are $x = 0$, $y = 3\text{m}$ and its velocity is $(6\text{m/s})\hat{i}$. When it is at point B its velocity and acceleration are:



- A) $-(6\text{ m/s})\hat{j}$ and $(12\text{ m/s}^2)\hat{i}$, respectively
 B) $(6\text{ m/s})\hat{i}$ and $-(12\text{ m/s}^2)\hat{i}$, respectively
 C) $(6\text{ m/s})\hat{j}$ and $(12\text{ m/s}^2)\hat{i}$, respectively
 D) $(6\text{ m/s})\hat{i}$ and $(12\text{ m/s}^2)\hat{j}$, respectively
 E) $(6\text{ m/s})\hat{j}$ and 0, respectively

19. A car rounds a 20-m radius curve at 10 m/s. The magnitude of its acceleration is:

- A) 0
 B) 0.20 m/s^2
 C) 5.0 m/s^2
 D) 40 m/s^2
 E) 400 m/s^2

20. A Ferris wheel with a radius of 8.0m makes 1 revolution every 10 s. When he is at the top, essentially a diameter above the ground, he releases a ball. How far from the point on the ground directly under the release point does the ball land?

- A) 0
 B) 1.0 m
 C) 8.0 m
 D) 9.1 m
 E) 16 m